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REPORT

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1. In the line of synthetic rubber, oil-extended rubber has been thoroughly investigated in the laboratory and, theoretically, is ready for production. The studies were based strictly on U.S. literature. It was found that 100 parts of Buna S-3 generally would tolerate 30 parts of plasticiser. Instead of Buna S-3, other S-grades with high deformation value could be used. The oils under investigation consisted of:

   a. Mineral oil from Lustkendorf (residual oil M),

   b. Plastikator BA -- a by-product from the styrene production at Buna,

   c. Plastikator FO -- an ester of hexametriol and pre-run fatty acids from the synthetic fatty acid production at Rodleben,

   d. "Lautschel," a residue from brown coal distillation.

All of these plasticisers were satisfactory, although not equally so. The Schopper elasticity values were:

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30 - 32 for product a.

38 - 39 for product b.

40 - 42 for product c.

indeterminate for product d.

The tensile strength was not good in product c. because the material does not have a true solvating action on the rubber, only swells it. Products a., b., and d. have satisfactory tensile strength. [redacted] 200 kg/cm.^{2} as average value and an elongation of 600 per cent. 50X1-HUM

2. The principal difficulty is the lack of sufficient quantities of products b., c., and d. for large scale production. Product a. could be obtained in adequate amounts, but it is not uniform inasmuch as Luetzkendorf obtains its crudes from different sources, e.g., from Rumania in one shipment, from Austria in the next. The quantities of oil-extended rubber made so far amounted to no more than 1,000 pounds per month. They all were made in the laboratory. [redacted] means a pilot plant as contrasted with production units./ 50X1-HUM

3. Cold rubber also has been investigated in the laboratory by Drs. NELLES and BREUERS, both "National Prize Recipients." Here again, U.S. literature formed the basis of the investigations which are complete. Manufacture of cold rubber could begin at any time, save for the lack of cooling machinery; the capacity of the latter is too small already. This low capacity is felt throughout the plant especially during the summer months.

4. [redacted] estimate the production of Buna S-4 at 300 - 400 tons per month. 50X1-HUM
This material is referred to as "geregelter" (regulated) Buna which means that the polymerization rate is controlled so that on fabrication a depolymerization becomes unnecessary. The control agent used is di-isopropylxanthogenate. The deformation value of S-4 is approximately 1,200. Subject material's principal drawback was sticking to the paper containers. In order to overcome this, a Buna rubber with higher deformation value is used now as a wrapper. This is not removed on conversion, but is incorporated. S-4 is used presently for specialties only, especially at the Firm of "Reifen-Mueller," Berlin-Schmoeckwitz, DDR; [redacted] It is desired eventually to replace all S-3 by S-4, but at present this is not possible because of the lack in plant capacity. 50X1-HUM

5. Chlorinated Buna (Chlor-Buna M) is manufactured but is difficult to sell. Subject material is very often used as an oil extender, and the paint works have sufficient oil. Also, chlorinated natural rubber, manufactured at Ammendorf (51-26N/11-59E) is plentiful and is preferred to the synthetic product.

6. The head of the Buna Testing Laboratory is Dipl. Ing. Hans LUTTROPP [redacted] 50X1-HUM

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7. Buna is the largest producer of polyvinylchloride in Europe manufacturing 3,000 - 3,500 tons per month. The resin is made according to the Nubilosa method in which an emulsifier is used. The latter made the resin unreliable for electrical insulation, and a new electrical grade has been developed, called "Imperial." This grade is subjected to a washing process with methanol whereby the emulsifier is extracted. Imperial is employed especially as wire and cable insulation and has a guaranteed insulation resistance 10^{15}. The ordinary grade is supposed to have a value of 10^{14}, but failures used to occur frequently. However, besides the influence of the emulsifier, [redacted] the failures were caused by other circumstances, such as unsuitable (acidic) plasticizers which would react with the lime in the walls, mechanical failures, and carelessness. Not noted in the specifications are dielectric constants. Under development is a suspension polymerization process which eventually will replace the Nubilosa method. Presently, however, the grain size is still too coarse.

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8. The plasticizers available for PVC are "Palatinol," phthalic acid esters made at Buna, grades AH and BH, also tricresyl phosphate and esters of synthetic fatty acids from Rodleben. While polymeric plasticizers were manufactured before World War II by I.G. Farben (known as Plastomoll), none are produced today. A mixture of PVC and Perbunan was used in tests, but no large scale operations are under way. Buna does not furnish resin-plasticizer mixes, while the VEB Elektrochemisches Kombinat Bitterfeld (51-37N/12-19E) does. The latter has a small PVC production. The mixes contain 15 - 20 per cent plasticizer. Finished materials are not made at Buna; the resin is furnished to the converters, such as Zelluloidwerke Eilenburg (51-28N/12-37E) where sheeting, plates, press parts and other articles are made. PVC is used in form of plastisols, i.e., a resin -plasticizer mix without solvent. The customary properties are 50:50 and 60:40. End uses are technical articles and toys. PVC alone (hard) is used for gutter pipes, battery cases, as acid resistant linings in tanks and kettles. Copolymers of PVC and PVA are under investigation, also of PVC and polyvinylidene chloride. These copolymers are said to be resistant to discoloration which occurs in PVC alone due to decomposition.

9. Polyvinylidene chloride is manufactured at Buna, but not in large quantities (Vinitex). It is made in form of latex. Acrylic acid esters also are made in latex form (Acrylite) and used as paper impregnants and for leather treatment. In charge of the latex development is Dr. MUEHLSTEFF.

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10. Continued without changes is the manufacture of polystyrene. Grade BV, glass clear, is the result of mass polymerization, while emulsion polymerization yields grade EF. [redacted] estimate [redacted] monthly production as 800-900 tons of grade BV, made in a continuous process. Acrylates are not manufactured at Buna, but they are produced in the USSR. Molding resins on a maleic acid base are in a very early development stage in my laboratory.

11. A new injection molding compound is in the pilot plant stage. This compound is a polyamid resin (nylon), made in an autoclave under pressure by reacting hexamethylene diamine with adipic acid. Acetic acid is used as a "stopper." The reaction mix is removed from the autoclave at 250-260°C under pressure, quenched in a water bath and cut up. Preferred as molding compound to pure nylon is a mix known as "9-A," consisting of 9 parts nylon and 1 part caprolactam. This seems to be more suitable for injection molding. The present end uses are zippers, combs and packing material. This and perlon also are used instead of metal, as the container for instance, for [redacted] elements which are shipped to the USSR; 9-A might also become the preferred material for fiber manufacture. This 9-A material is particularly suited as a valve blade in compressors for hydrogen and nitrogen installations. The commonly used metal blades (steel) were of very limited durability and often broke. The plastics blades are much more durable. The material is good for such purposes as gaskets, and wherever the temperatures will remain below 80-100°C. When the temperatures go beyond that, the small amount of water entrapped in the resin (acting as a plasticizer) escapes, and the plastic becomes exceedingly brittle and breaks easily. Above 100-120°C, and if exposed to air, oxidation sets in rapidly. At normal temperatures, great elasticity is one of the main features of the polyamid. [redacted] a pocket comb which [redacted] was able to bend at will. The comb was black, [redacted] materials of the AH grade with flaws were colored black, while good grades are a natural yellowish-grey (opaque). Other colors can be furnished. The materials actually are colored throughout. This is accomplished by using dyestuff rather than pigments. The material becomes glass clear only in highly oriented parts like on thin edges. 7 50X1-HUM 50X1-HUM 50X1-HUM 50X1-HUM

12. Work is in progress to utilize the nylon resin for bearings. One difficulty still existing is the molding of large parts, up to 2 kg. Heating throughout the resin, even electrically, is not easily accomplished, and the edges tend to become overheated with accompanying decomposition. Extrusion is not practiced because no suitable machines are available. The extruders used in rubber manufacture are short, having a ratio of length to diameter of 3:1 or 4:1 while for nylon or PVC a ratio of 10:1 or 12:1 is indicated.

13. Buna manufactures polyacrylonitrile at a rate of 2 to 3 tons per month. This material is shipped to SAG Filmfabrik AGFA Wolfen (51-40N/12-17E) where it is spun into fiber. The department [redacted] tests and develops fibers and their general application. The polymerization of the acrylonitrile is studied in a different laboratory, also at Buna. The Institute for Synthetic Fiber Research at Teltow-Seehof (52-24N/13-16E), [redacted] which is supposed to be the sole research agency on fibers in the DDR, is fully disregarded, and everything is handled exclusively between Buna and AGFA. 50X1-HUM 50X1-HUM 50X1-HUM

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14. In spite of this research competition, all plastics research is planned to avoid duplication. The Planning Committee of the "Abteilung Forschung und Technik" (Department for Research and Technology) under Dr. PANNING held a meeting at Bitterfeld and charged each plant with certain tasks. The VEB Elektrochemisches Kombinat Bitterfeld was ordered to begin the study of fluorine-containing polymers (Teflon and Kel-F), and it must be assumed that laboratory work on those materials is now in progress.